

AS Unit 1: Basic Biochemistry and Cell Organisation

Name:	Date:
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Topic 1.3 Cell Membranes and Transport – Page 4

I. Questions on water potential

		Completed
1.	Complete the questions on the hand-out Practice Questions <ul style="list-style-type: none">• Define the term incipient plasmolysis.• In a practical situation how would you go about determining the concentration of the cytosol of a plant cell?	
2.	Revise for a test on Cell Membranes and Transport	

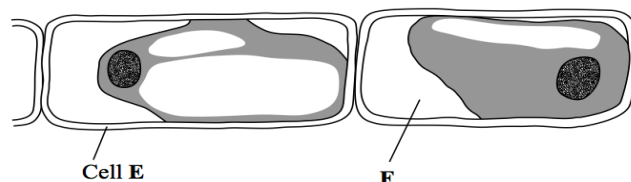
1.

Tradescantia is a house plant. There are small hairs on its flowers. These hairs are made of cells. **Figure 1** shows the appearance of cells from one of these hairs after 20 minutes in distilled water. **Figure 2** shows cells from another hair after 20 minutes in a solution of potassium nitrate.

Figure 1 (in distilled water)



Figure 2 (in potassium nitrate solution)



- (a) What does **Figure 2** suggest about the permeability of the plasma membranes surrounding these cells?

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(1 mark)

- (b) What is present in the space labelled **F**? Explain your answer.

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(2 marks)

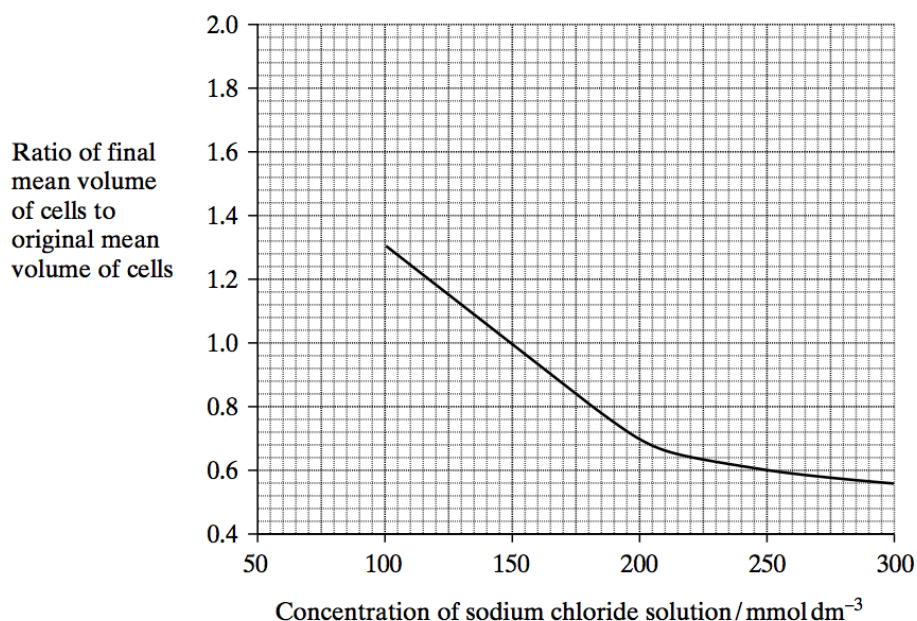
- (c) How would the water potential of the sap in the vacuole of cell **E** differ from the water potential of the sap in the vacuole of cell **D**? Explain your answer.

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(3 marks)

2.

Red blood cells were left for the same length of time in sodium chloride solutions of different concentrations. The final mean volume of the red cells was then compared with the original mean volume. The results are shown in the graph.



- (a) Use the terms isotonic, hypotonic or hypertonic to explain the results for red cells placed in a sodium chloride solution of concentration

(i) 100 mmol dm^{-3} ;

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(ii) 150 mmol dm^{-3} .

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(4 marks)

- (b) No intact cells could be seen in the 50 mmol dm^{-3} sodium chloride solution at the end of the experiment. Only fragments of membranes could be found. Explain why.

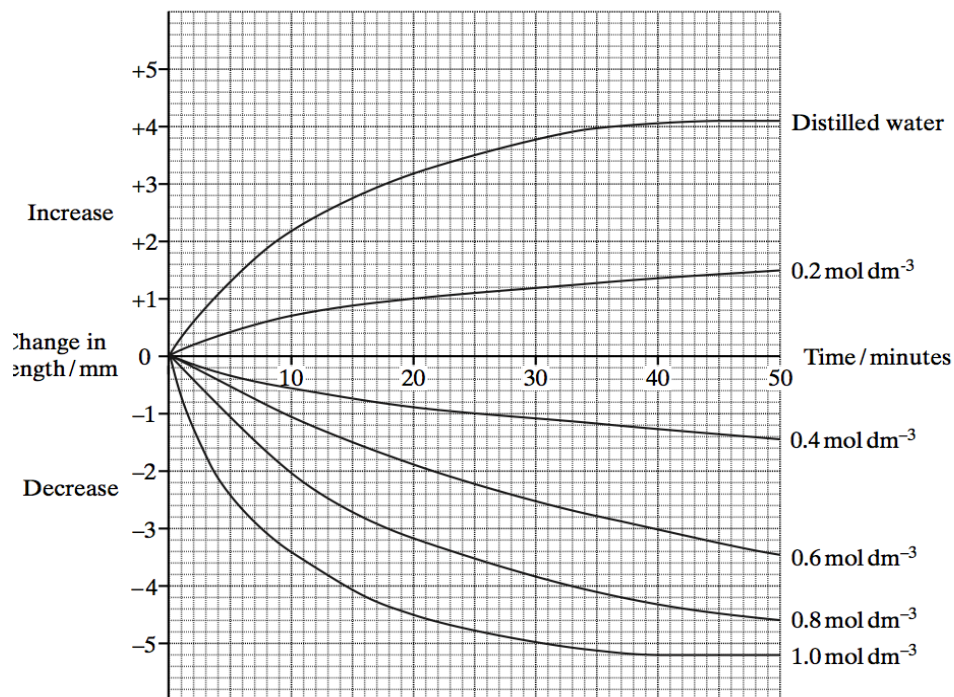
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(1 mark)

3.

Six cylinders of a standard size were cut from a single large potato. One cylinder was placed in distilled water and the others were placed in sucrose solutions of different concentrations. The length of each cylinder was measured every 5 minutes for the next 50 minutes. The graph shows the changes in length at each sucrose concentration.



(a) Explain why

(i) the potato cylinder in distilled water increased in length;

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(2 marks)

- (ii) the potato cylinder in the 1.0 mol dm^{-3} sucrose solution showed no further decrease in length after 40 minutes.

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(2 marks)

- (b) (i) Describe the difference in the rate of decrease in length during the first 10 minutes between the cylinder in the 0.4 mol dm^{-3} and the cylinder in the 0.8 mol dm^{-3} solution.

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(1 mark)

- (ii) Use your knowledge of water potential to explain this difference.

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(1 mark)

4.

- (a) A plant cell was observed with an optical microscope. Describe how the length of the cell could be estimated.

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(2 marks)

- (b) The water potential of a plant cell is -400 kPa. The cell is put in a solution with a water potential of -650 kPa. Describe and explain what will happen to the cell.

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(3 marks)

- (c) A group of students investigated the effect of sucrose concentration on the change in length of cylinders of tissue cut from a young carrot. They measured the initial lengths of the carrot cylinders, then placed one in each of a number of sucrose solutions. After 18 hours, they removed the carrot cylinders and measured their final lengths. Some of the results are shown in the table.

Concentration of sucrose / mol dm ⁻³	Percentage decrease in length of carrot cylinder
0.4	4.2
0.5	8.7
0.6	13.0
0.7	16.8
0.8	18.1
0.9	18.1
1.0	18.1

- (i) The carrot cylinders were left for 18 hours in the sucrose solutions. Explain why they were left for a long time.

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(1 mark)

- (ii) Explain how you would use a graph to predict the concentration of sucrose that would result in no change in length of the carrot cylinders.

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(2 marks)

- (iii) Young carrots store sugars in their tissues but, in older carrots, some of this is converted to starch. How would using cylinders of tissue from older carrots affect the results obtained for a sucrose solution of 0.6 mol dm^{-3} ? Give a reason for your answer.

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(2 marks)